What is claimed is:

1. 1.   A radiolabeled immunotoxin comprising a toxic domain, a targeting domain, and at least one radionuclide atom, wherein the targeting domain is a single-chain Fv (sFv) antibody fragment that binds to a target molecule on a target cell, wherein the target molecule is not an ε chain of a T cell CD3 complex.

2. 2.   The radiolabeled immunotoxin of claim 1, wherein the toxic domain is a toxic polypeptide selected from the group consisting of: (a) ricin, (b) *Pseudomonas* exotoxin (PE); (c) bryodin; (d) gelonin; (e) α-sarcin; (f) aspergillin; (g) restrictocin; (h) angiogenin; (i) saporin; (j) abrin; (k)pokeweed antiviral protein (PAP); (l) a ribonuclease; (m) a pro-apoptotic polypeptide; and (n) a functional fragment of any of (a)-(m).

3. 3.   The radiolabeled immunotoxin of claim 1, wherein the toxic domain is diphtheria toxin (DT) or a functional fragment thereof.

4. 4.   The radiolabeled immunotoxin of claim 3, wherein the toxic domain comprises amino acids 1-389 of DT.

5. 5.   The radiolabeled immunotoxin of claim 1, wherein the target cell is a cancer cell.

6. 6.   The radiolabeled immunotoxin of claim 5, wherein the cancer cell is selected from the group consisting of a neural tissue cancer cell, a melanoma cell, a breast cancer cell, a

4 lung cancer cell, a gastrointestinal cancer cell, an ovarian

5 cancer cell, a testicular cancer cell, a lung cancer cell, a

6 prostate cancer cell, a cervical cancer cell, a bladder cancer

7 cell, a vaginal cancer cell, a liver cancer cell, a renal

8 cancer cell, a bone cancer cell, and a vascular tissue cancer

9 cell.

1 7.   The radiolabeled immunotoxin of claim 5, wherein the

2 target molecule is Her-2/neu.

1 8.   The radiolabeled immunotoxin of claim 5, wherein the

2 target molecule is selected from the group consisting of a

3 mucin molecule, carcinoembryonic antigen (CEA), prostate-

4 specific antigen (PSA), folate binding receptor, A33 alpha

5 fetoprotein, CA-125 glycoprotein, colon-specific antigen p,

6 ferritin, p-glycoprotein, G250, OA3, PEM glycoprotein, L6

7 antigen, 19-9, P97, placental alkaline phosphatase, 7E11-C5,

8 17-1A, TAG-72, 40 kDa glycoprotein, URO-8, a tyrosinase, an

9 interleukin- (IL-)2 receptor polypeptide, an IL-3 receptor

10 polypeptide, an IL-13 receptor polypeptide, an IL-4 receptor

11 polypeptide, a vascular endothelial growth factor (VEGF)

12 receptor, a granulocyte macrophage-colony stimulating factor

13 (GM-CSF) receptor polypeptide, an epidermal growth factor

14 (EGF) receptor polypeptide, an insulin receptor polypeptide,

15 an insulin-like growth factor receptor polypeptide,

16 transferrin receptor, estrogen receptor, a T cell receptor

17 (TCR) α-chain, a TCR β-chain, a CD4 polypeptide, a CD8

18 polypeptide, a CD7 polypeptide, a B cell immunoglobulin (Ig)

19 heavy chain, a B cell Ig light chain, a CD19 polypeptide, a

20 CD20 polypeptide, a CD22 polypeptide, a MAGE polypeptide, a

21 BAGE polypeptide, a GAGE polypeptide, a RAGE polypeptide, a

22 PRAME polypeptide, and a GnTV polypeptide.

1 9. The radiolabeled immunotoxin of claim 1, wherein the

2 radionuclide is selected from the group consisting of ^{90}Y,

3 ^{186}Re, ^{188}Re, ^{64}Cu, ^{67}Cu, ^{212}Pb, ^{212}Bi, ^{213}Bi, ^{123}I, ^{125}I, ^{131}I, ^{211}At,

4 ^{32}P, ^{177}Lu, ^{47}Sc, ^{105}Rh, ^{109}Pd, ^{153}Sm, ^{199}Au, ^{99m}Tc, ^{111}In, ^{124}I, ^{18}F,

5 ^{11}C, ^{198}Au, ^{75}Br, ^{76}Br, ^{77}Br, ^{13}N, ^{34m}Cl, ^{38}Cl, ^{52m}Mn, ^{55}Co, ^{62}Cu,

6 ^{68}Ga, ^{72}As, ^{76}As, ^{72}Se, ^{73}Se, and ^{75}Se.

1 10. A radiolabeled multimeric immunotoxin comprising:

2 (a) at least two monomers; and

3 (b) at least one radionuclide atom,

4 wherein each monomer comprises a targeting domain

5 and a toxic domain and is physically associated with the other

6 monomers,

7 wherein the targeting domain binds to a target

8 molecule on a target cell.

1 11. The radiolabeled multimeric immunotoxin of claim 10,

2 wherein each of said monomers further comprises one or more

3 coupling moieties and the physical association of the monomer

4 is by at least one of the one or more coupling moieties.

1 12. The radiolabeled multimeric immunotoxin of claim 11,

2 wherein the coupling moiety is a terminal moiety.

1 13. The radiolabeled multimeric immunotoxin of claim 12,

2 wherein the terminal moiety is a C-terminal moiety.

1 14.   The radiolabeled multimeric immunotoxin of claim 11,
2 wherein the one or more coupling moieties are cysteine
3 residues.

1 15.   The radiolabeled multimeric immunotoxin of claim 11,
2 wherein at least one of the one or more coupling moieties is a
3 heterologous coupling moiety.

1 16.   The radiolabeled multimeric immunotoxin of claim 10,
2 wherein each of the monomers comprises the same amino acid
3 sequence.

1 17.   An *in vitro* method of killing a target cell, the
2 method comprising culturing the target cell with the
3 radiolabeled immunotoxin of claim 1.

1 18.   A method comprising:
2   (a) identifying a subject suspected of having a
3 pathogenic cell disease; and
4   (b) administering to the subject a radiolabeled
5 immunotoxin comprising a toxic domain, a targeting domain, and
6 at least one radionuclide atom, wherein the targeting domain
7 is a sFv antibody fragment that binds to a target molecule on
8 a target cell in the subject.

1 19.   The method of claim 18, wherein the toxic domain is
2 a toxic polypeptide selected from the group consisting of: (a)
3 ricin, (b) *Pseudomonas* exotoxin (PE); (c) bryodin; (d)
4 gelonin; (e) α-sarcin; (f) aspergillin; (g) restrictocin; (h)
5 angiogenin; (i) saporin; (j) abrin; (k) pokeweed antiviral
6 protein (PAP); (l) a ribonuclease; (m) a pro-apoptotic
7 polypeptide, and (n) a functional fragment of any of (a)-(m).

1   20.   The method of claim 18, wherein the toxic domain is
2   diphtheria toxin (DT) or a functional fragment thereof.

1   21.   The method of claim 20, wherein the functional
2   fragment comprises amino acids 1-389 of DT.

1   22.   The method of claim 18, wherein the target cell is a
2   cancer cell.

1   23.   The method of claim 22, wherein the cancer cell is
2   selected from the group consisting of a neural tissue cancer
3   cell, a melanoma cell, a breast cancer cell, a lung cancer
4   cell, a gastrointestinal cancer cell, an ovarian cancer cell,
5   a testicular cancer cell, a lung cancer cell, a prostate
6   cancer cell, a cervical cancer cell, a bladder cancer cell, a
7   vaginal cancer cell, a liver cancer cell, a renal cancer cell,
8   a bone cancer cell, and a vascular tissue cancer cell.

1   24.   The method of claim 22, wherein the target molecule
2   is Her-2/neu.

1   25.   The method of claim 22, wherein the target molecule
2   is selected from the group consisting of a mucin molecule,
3   CEA, PSA, folate binding receptor, A33 alpha fetoprotein, CA-
4   125 glycoprotein, colon-specific antigen p, ferritin, p-
5   glycoprotein, G250, OA3, PEM glycoprotein, L6 antigen, 19-9,
6   P97, placental alkaline phosphatase, 7E11-C5, 17-1A, TAG-72,
7   40 kDa glycoprotein, URO-8, a tyrosinase, an interleukin-
8   (IL-)2 receptor polypeptide, an IL-3 receptor polypeptide, an
9   IL-13 receptor polypeptide, an IL-4 receptor polypeptide, a
10   VEGF receptor, a GM-CSF receptor polypeptide, an EGF receptor

11 polypeptide, an insulin receptor polypeptide, an insulin-like

12 growth factor receptor polypeptide, transferrin receptor,

13 estrogen receptor, a T cell receptor (TCR) α-chain, a TCR β-

14 chain, a CD4 polypeptide, a CD8 polypeptide, a CD7

15 polypeptide, a B cell Ig heavy chain, a B cell Ig light chain,

16 a CD19 polypeptide, a CD20 polypeptide, a CD22 polypeptide, a

17 MAGE polypeptide, a BAGE polypeptide, a GAGE polypeptide, a

18 RAGE polypeptide, a PRAME polypeptide, and a GnTV polypeptide.

1 26.   The method of claim 18, wherein the method is a

2 method of killing a target cell in the subject.

1 27.   The method of claim 26, wherein the radionuclide is

2 selected from the group consisting of ^{90}Y, ^{186}Re, ^{188}Re, ^{64}Cu,

3 ^{67}Cu, ^{212}Pb, ^{212}Bi, ^{213}Bi, ^{123}I, ^{125}I, ^{131}I, ^{211}At, ^{32}P, ^{177}Lu, ^{47}Sc,

4 ^{105}Rh, ^{109}Pd, ^{153}Sm, and ^{199}Au.

1 28.   The method of claim 18, wherein the method is an

2 imaging method.

1 29.   The method of claim 28, wherein the radionuclide is

2 selected from the group consisting of ^{186}Re, ^{188}Re, ^{64}Cu, ^{67}Cu,

3 ^{212}Bi, ^{123}I, ^{131}I, ^{211}At, ^{177}Lu, ^{47}Sc, ^{105}Rh, ^{109}Pd, ^{153}Sm, ^{199}Au, ^{99m}Tc,

4 ^{111}In, ^{124}I, ^{18}F, ^{11}C, ^{198}Au, ^{75}Br, ^{76}Br, ^{77}Br, ^{13}N, ^{34m}Cl, ^{38}Cl, ^{52m}Mn,

5 ^{55}Co, ^{62}Cu, ^{68}Ga, ^{72}As, ^{76}As, ^{72}Se, ^{73}Se, and ^{75}Se.

1 30.   A method of making a radiolabeled immunotoxin, the

2 method comprising:

3   (a) providing a cell comprising a vector containing

4 a nucleic acid sequence encoding a protein, the nucleic acid

5 sequence being operably linked to a transcriptional regulatory

6 element (TRE);

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7   (b) culturing the cell;

8   (c) extracting the protein from the culture; and

9   (d) attaching at least one radionuclide atom to the

10   protein,

11   wherein the protein comprises a toxic domain and a

12   targeting domain,

13   wherein the targeting domain is a sFv antibody

14   fragment that binds to a target molecule on a target cell,

15   wherein the target molecule is not a polypeptide of the CD3

16   complex.

1   31.   A method of making a radiolabeled multimeric

2   immunotoxin, the method comprising:

3   (a) providing one or more cells, each of the cells

4   comprising a nucleic acid sequence encoding a monomer with a

5   different amino acid sequence, wherein the nucleic acid

6   sequence is operably linked to a TRE;

7   (b) separately culturing each of the one or more

8   cells;

9   (c) extracting the monomer from each of the

10   cultures;

11   (d) exposing the monomers to conditions which allow

12   multimerization of the monomers to form a multimer comprising

13   at least two monomers; and

14   (e) attaching at least one radionuclide atom to the

15   multimer,

16   wherein each monomer comprises a targeting domain

17   and a toxic domain,

18   wherein the targeting domain binds to a target

19   molecule on a target cell.

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1 32.   A method of making a radiolabeled immunotoxin, the
2 method comprising:
3   (a) providing a protein comprising a toxic domain
4 and a targeting domain; and
5   (b) attaching at least one radionuclide atom to the
6 protein,
7   wherein the targeting domain is a sFv antibody
8 fragment that binds to a target molecule on a target cell,
9 wherein the target molecule is not an ε chain of a T cell CD3
10 complex.

1 33.   A method of making a radiolabeled multimeric
2 immunotoxin, the method comprising:
3   (a) providing a multimeric protein; and
4   (b) attaching at least one radionuclide atom to the
5 multimeric protein;
6   wherein the multimeric protein comprises at least
7 two monomers,
8   wherein each monomer comprises a targeting domain
9 and a toxic domain and is physically associated with the other
10 monomers,
11   wherein the targeting domain binds to a target
12 molecule on a target cell.

1 34.   The radiolabeled multimeric immunotoxin of claim 10,
2 wherein the targeting domain is an antibody fragment.

1 35.   The radiolabeled multimeric immunotoxin of claim 34,
2 wherein the antibody fragment is a sFv.

1 36.   The radiolabeled multimeric immunotoxin of claim 34,
2 wherein the antibody fragment binds to a target molecule on a
3 T cell.

1   37.   The radiolabeled multimeric immunotoxin of claim 34,

2   wherein the target molecule is a CD3 polypeptide.

1   38.   The radiolabeled multimeric immunotoxin of claim 10,

2   wherein the targeting domain is a targeting polypeptide

3   selected from the group consisting of: (a) a cytokine; (b) a

4   ligand for a cell adhesion receptor; (c) a ligand for a signal

5   transduction receptor; (d) a hormone; (e) a molecule that

6   binds to a death domain family molecule; (f) an antigen; and

7   (g) a functional fragment of any of (a) - (f).

1   39.   The radiolabeled immunotoxin of claim 1, further

2   comprising one or more additional targeting domains.